

# The challenges of human population ageing

MIRIAM SANDER<sup>1</sup>, BJARKE OXLUND<sup>2</sup>, ASTRID JESPERSEN<sup>2</sup>, ALLAN KRASNIK<sup>2</sup>, ERIK LYKKE MORTENSEN<sup>2</sup>,  
RUDI GERARDUS JOHANNES WESTENDORP<sup>3</sup>, LENE JUEL RASMUSSEN<sup>2</sup>

<sup>1</sup>Page One Editorial Services, 685 Poplar Avenue, Boulder, CO 80304, USA

<sup>2</sup>Center for Healthy Aging, University of Copenhagen, Copenhagen, Denmark

<sup>3</sup>Department of Gerontology and Geriatrics, Leyden Academy on Vitality and Ageing, Leiden University Medical Centre, Leiden, Netherlands

Address correspondence to: L. J. Rasmussen. Tel: (+45) 35326717. Email: [lenera@sund.ku.dk](mailto:lenera@sund.ku.dk)

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## Abstract

The 20th century saw an unprecedented increase in average human lifespan as well as a rapid decline in human fertility in many countries of the world. The accompanying worldwide change in demographics of human populations is linked to unanticipated and unprecedented economic, cultural, medical, social, public health and public policy challenges, whose full implications on a societal level are only just beginning to be fully appreciated. Some of these implications are discussed in this commentary, an outcome of *Cultures of Health and Ageing*, a conference co-sponsored by the University of Copenhagen (UCPH) and the Center for Healthy Ageing at UCPH, which took place on 20–21 June 2014 in Copenhagen, Denmark. Questions discussed here include the following: what is driving age-structural change in human populations? how can we create ‘age-friendly’ societies and promote ‘ageing-in-community’? what tools will effectively promote social engagement and prevent social detachment among older individuals? is there a risk that further extension of human lifespan would be a greater burden to the individual and to society than is warranted by the potential benefit of longer life?

**Keywords:** *lifespan, health span, vitality, demographics, age-structure, older people*

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The demographics of the global human population is drastically different now than 100 years ago [1, 2]. Worldwide, the fraction of individuals >60 years increased from 9.2% in 1990 to 11.7% in 2013 and is projected to reach 21.1% (>2 billion) by 2050. In light of this trend, the mechanisms of human ageing are being urgently debated and investigated in research institutions around the world. Leading-edge ageing research leverages expertise from many disciplines, to (i) identify the socio-cultural, psychological, economic and public health implications of human population ageing; (ii) identify and understand the molecular biological and physiological bases of human ageing and (iii) identify factors that promote health in later life and/or protect against ageing-related disease and dysfunction. The following paragraphs summarise several compelling ideas and concerns of the ageing research community, as discussed at the conference *Cultures of Health and Ageing*, 20–21 June 2014, in Copenhagen, Denmark, sponsored by University of

Copenhagen (UCPH) and the Center for Healthy Ageing at UCPH.

## The drivers of human population ageing

Change in the age-structure of human populations reflects decrease in average human fertility rates to  $\leq 1.5$  births per woman and continuing increase in human lifespan. In very few countries (for example Vietnam), age-structural change has led to decreases in youth and total dependency while the size of the working age population and the standard of living has increased. In many more countries (for example Italy), the total dependency ratio is increasing as the working age population is shrinking, and long-standing social conventions, such as designated pension age and poor acceptance of women in the workforce, present obstacles to adaptive change. In Italy, the only options for stimulating economic recovery are increased fertility and/or increased immigration, which is negligible at present.

## Socio-cultural challenges of population ageing

Human societies will need to develop mechanisms and social practices in the future to minimise or mitigate social detachment, which is common in older individuals, especially in communities that lack social capital. Lack of social capital reflects the fact that the typical family structure provides less intergenerational support today than in the past, and recent studies show that persistent or recurrent periods of social detachment are associated with significant health risks [3].

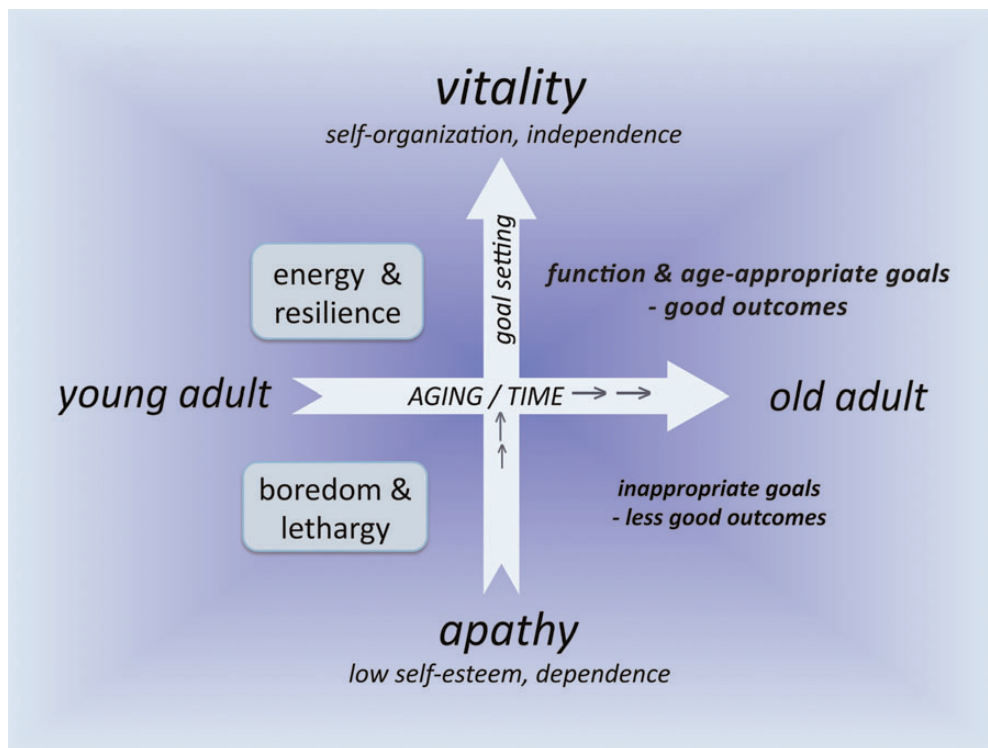
Social innovations are needed to allow individuals to age in the same communities in which they work and live in middle and early-late life [4]. The relatively new concepts of the ‘age-friendly community’ and the ‘age-friendly society’ presume that older individuals remain active agents of their own care. Innovative social experiments along these lines are emerging worldwide: in the United States, they include virtual and non-virtual elder-engaged community-support networks [5]; in the Israeli Galilee, workshops are promoting small business entrepreneurship during retirement years; in Kashiwa and Fukui, Japan, social innovations are increasing access to health care and helping older individuals remain socially connected and physically mobile. Ayurvedic Laughing Clubs of India and the Community Gardens of Harlem, NY, USA, are forms of

‘crowd sourcing’, a practice that generates a strong sense of emotional and physical well-being among all participants, independent of their age. Crowd sourcing represents a possible model for creating functional elderly or intergenerational communities.

## Beyond the biomedical view of human ageing: honouring human dignity

Increase in lifespan and decrease in early mortality is a positive development for humanity as a whole. However, the post-retirement years of life can be challenging or even unwelcome, when an individual lives with disease, disability, declining cognition and/or dementia. Therefore, it is worth asking whether and when enough years are enough. Although some studies suggest that self-rated quality of life is surprisingly independent of health status, what appears to matter most to older individuals is retaining sufficient physical and cognitive function to carry out independence-related activities of daily living without assistance. Loss of these abilities challenges an individual’s sense of self-worth and dignity.

Furthermore, the oldest old are disproportionately affected by Alzheimer’s disease and other forms of cognitive impairment. In 2012, the combined prevalence of these diseases in



**Figure 1.** Ageing self-represented with a function-dependent axis and a function-independent quality of life axis. Ageing/time is represented on the horizontal axis, moving unidirectionally from left to right. Ageing transforms the young adult to an old adult and is eventually and inevitably accompanied by functional loss at or near the end of maximum life expectancy. At all ages of adulthood, personal goal setting increases vitality and decreases apathy (represented as the vertical quality of life axis), while lack of goal setting has the opposite effect. Vitality is associated with self-organization, independence, energy, resilience and increasing quality of life. Apathy is associated with low self-esteem, dependence, boredom, lethargy and poor quality of life. Ageing is inevitable, but function- and age-appropriate goal setting enhances quality of life and leads to better psychological outcomes than setting no goals, minimal goals or inappropriate goals.

the United States was 21, 53 and 76% for 71–79, 80–89 and 90 + age groups, respectively [6–8]. Few tools are available to mitigate the symptoms of these diseases, and no tools are available to prevent them. Clearly, the challenge of managing the population of elderly who experience serious cognitive dysfunction is daunting, and this problem alone should create some doubt about the value of further extending human lifespan.

### Time/age as a unidirectional vector

Physical/functional metrics fail to capture a less concrete dimension of the human life trajectory, which can be referred to as the ‘vitality/apathy’ axis [9] (Figure 1). Although time and ageing are unidirectional (Figure 1, horizontal axis), adult humans who retain sufficient cognitive function have the ability set personal goals, a process that leads to increasing ‘self-organization’ and increasing quality of life at all life stages (Figure 1, vertical axis); thus, the ‘vitality/apathy’ axis is bidirectional. The end of life, death, brings with it complete loss of self-organization, but disease, disability and/or frailty in late life restrict personal goal setting. Function- and age-appropriate goal setting enhances quality of life at all life stages; but it is not easy for an individual to identify the right set of goals at the right time.

### Population ageing: a biological, social and a cultural challenge for the 21st century

In summary, human population ageing presents three challenges: the biological challenge is to retain a high level of physical and mental capacity in late stages of life; the social challenge is to optimise the retirement age and the cultural challenge is to provide older individuals with the opportunity to live with purpose and dignity. To address these challenges, scientists and non-scientists alike need to cooperatively build bridges between research domains relevant to human ageing. Our understanding of the biological and lifestyle factors that modulate life trajectories must also increase and be leveraged towards increasing human health span in step with human lifespan.

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### Key points

- Increased average age of the human population presents huge challenges to society.
  - New approaches towards creating ‘age-friendly’ societies are emerging worldwide.
  - Human quality of life is enhanced by age-appropriate and function-appropriate goals.
  - Human ageing is inevitably associated with declining function in later years; however, at all life stages, humans can move upward or downward on the vitality/apathy axis.
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### Conflicts of interest

None declared.

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### References

1. United Nations. Department of Economic and Social Affairs, Population division. World Popul Ageing 2013; 3–29.
2. Oeppen J, Vaupel JW. Demography: broken limits to life expectancy. *Science* 2002; 296: 1029–31.
3. Jivraj S, Nazroo J, Barnes M. Change in social detachment in older age in England. In: Banks J, Nazroo J, Steptoe A, eds. *The Dynamics of Ageing: Evidence From the English Longitudinal Study of Ageing 2002–10 (Wave 5)*. London, UK: Institute for Fiscal Studies, 2012.
4. Kendig H, Browning C, Thomas S, Wells Y. Health, lifestyle and gender influences on ageing well: an Australian longitudinal analysis to guide health promotion. *Public Health Front* 2014; 2: 3389.
5. Lehning A, Scharlach A, Price WJ. An emerging typology of community ageing initiatives. *J Community Pract* 2012; 3: 293–316.
6. Hurd MD, Martorell P, Delavande A, Mullen KJ, Langa KM. Monetary costs of dementia in the United States. *N Engl J Med* 2013; 368: 1326–34.
7. Baltes PB, Smith J. New frontiers in the future of ageing: from successful ageing of the young old to the dilemmas of the fourth age. *Gerontology* 2003; 49: 123–35.
8. Plassman BL, Langa KM, Fisher GG *et al.* Prevalence of dementia in the United States: the Ageing, Demographics, and Memory Study. *Neuroepidemiology* 2007; 29: 125–32.
9. Westendorp RG, Mulder B, van der Does AJW, van der Ouderaa FJG. When vitality meets longevity: new strategies for health in later life. In: *Wellbeing in Later Life: A Complete Reference Guide*, Vol. 4. London, UK: John Wiley & Sons, Ltd., 2013; 219–34.

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